Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Expanding Flexible Use of the 3.7 to 4.2 GHz band, *et. al.*	)	GN Docket No. 18-122
	)	
Petition for Rulemaking to Amend and Modernize Parts 25 and 101 of the Commission's Rules to Authorize and Facilitate the Deployment of Licensed Point-to-Multipoint Fixed Wireless Broadband Service in the 3.7-4.2 GHz Band	)	RM-11791
	)	
Petition for Rulemaking to Amend and Modernize Parts 25 and 101 of the Commission's Rules to Authorize and Facilitate the Deployment of Licensed Point-to-Multipoint Fixed Wireless Broadband Service in the 3.7-4.2 GHz Band	)	RM-11778
	)	

REPLY COMMENTS OF SAMSUNG ELECTRONICS AMERICA

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I. INTRODUCTION

Samsung Electronics America, Inc. ("Samsung") submits these comments in response to the Wireless Telecommunications Bureau, International Bureau, Office of Engineering and Technology, and Office of Economics and Analytics Public Notice soliciting additional comment on the 3.7-4.2 GHz band ("C-band") proceeding.[1] Samsung applauds the commitment of the Federal Communications Commission ("Commission") to accelerate the provision of fifth generation ("5G") wireless services and devices operating in mid-band spectrum. By making C-band spectrum available under a flexible regulatory framework, the Commission's proposals will help to expedite the deployment of 5G and provide an important building block in the overall 5G spectrum portfolio which requires spectrum in low-, mid- and high-bands.

For almost a decade, Samsung and our partners across industry and government have worked tirelessly to develop and nurture the technologies that will thrust the world into a whole new level of intelligence and connectivity. Often referred to as the Fourth Industrial Revolution, this fundamental shift will change the way consumers, businesses and governments interact with the world around them. While artificial intelligence, cloud computing, and the Internet of Things are changing how we use and interact with technology, the high speed, low latency and massive throughput enabled by 5G will be the catalyst for new applications and use cases to truly thrive.

We at Samsung could not be more excited by 5G's potential, especially since we are currently the only company in the world whose 5G portfolio spans the entire ecosystem—from chips to network equipment to mobile devices—with a trusted, flexible supply chain. Samsung

[1] Public Notice, and Wireless Telecommunications Bureau, International Bureau, Office of Engineering and Technology, and Office of Economics and Analytics Seek Focused Additional Comment In 3.7-4.2 GHz Band Proceeding, GN Docket No. 18-122, RM-11791, RM11778, DA 19-678 (rel. July 19, 2019) ("*Public Notice*").

is a global 5G leader, uniquely positioned to bring the power of 5G to our customers. In the past year leading mobile operators worldwide and in the United States have selected Samsung as a 5G network solutions provider.[2] Earlier this year we released our first 5G mobile device, the Galaxy S10 5G, which supports 5G networks in the 2.5 GHz, 28 GHz and 39 GHz bands.[3] We have continued this momentum as we announced our next 5G mobile device, the Samsung Galaxy Note 10+ 5G on August 7.[4] The Galaxy Note10+ 5G features the biggest Note display ever with a 6.8-inch Cinematic Infinity Display on a device that's still easy to hold and easy to use. The device will harnesses the full power of the next generation network for streaming high resolution video, downloading content hyper fast, and streaming graphics-heavy games in real time.

II. THE TECHNICAL PARAMETERS FOR C-BAND OPERATIONS MUST NOT BE OVERLY RESTRICTIVE

From our perspective as a supplier of both network equipment and mobile devices, Samsung would like to provide input on the Commission's proposed technical parameters for the C-band and respond to comments that others have provided on the record.

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[2] "AT&T Makes World's First Standards-Based Mobile 5G Millimeter Wave Connection", Sept. 10, 2018, https://about.att.com/story/2018/5g_cities_2018_2019.html (visited Aug. 13, 2019). "Samsung and Sprint Deploy 5G New Radio (NR) Solution in Preparation for Commercial 5G Service Roll, Feb. 25, 2019, https://www.samsung.com/global/business/networks/insights/press-release/samsung-and-sprint-deploy-5g-nr-solutions-in-preparation-for-commercial-5g-service-roll-out/ (visited Aug. 8, 2019). "Samsung Supports Verizon's 5G Home Launch with 5G End-to-End Solutions", Sept. 13, 2018, https://www.samsung.com/global/business/networks/insights/press-release/samsung-supports-verizons-5g-home-launch-with-5g-end-to-end-solutions/ (visited Aug. 8, 2019).

[3] "The Next Generation Speed and Performance Starts with Galaxy S10 5G, Samsung's First 5G Smartphone on the Market", Apr. 1, 2019, https://news.samsung.com/global/the-next-generation-speed-and-performance-starts-with-galaxy-s10-5g-samsungs-first-5g-smartphone-on-the-market (visited Aug. 8, 2019).

[4] "Introducing Galaxy Note 10: Designed to Bring Passions to Life with Next-Level Power", August 8, 2019, https://news.samsung.com/global/introducing-galaxy-note10-designed-to-bring-passions-to-life-with-next-level-power (viewed August, 8, 2019)

Samsung supports the Commission's proposal to extend the AWS power limits in Section 27.50(d)(1)-(2) of its rules to apply to both fixed and base stations in the C-band.[5] These rules limit base station power in non-rural areas to 1640 watts EIRP (for emission bandwidths less than one megahertz) and to 1640 watts per MHz EIRP (for emission bandwidths greater than one megahertz), and permit double these limits in rural areas, for antenna heights up to 300 meters. As the Commission notes, the AWS limits have "provided good service while avoiding harmful interference," and the higher power limit for rural areas may "promote the Commission's goals of furthering rural deployment of broadband services."[6] Samsung agrees. The proposed power levels are important to enable service coverage in the C-band which may experience slightly higher propagation loss than in the lower bands.

As noted by many others, the Commission should refrain from imposing a 75 dBm EIRP limit on the aggregated total power of a fixed or base station, summed over all antenna elements.[7] Such a limitation would unnecessarily restrict operations using relatively large channel bandwidths, which are crucial for the kinds of high-throughput applications that 5G will uniquely enable. As an example of how such a limit would restrict C-band services, consider a 50 MHz channel providing services in a rural area by employing a massive multiple-input, multiple-output (M-MIMO) base station with 16 layers (beams). The rural power limit of 3280 W/MHz (65.2 dBm/MHz) would have to be reduced by 7.2 dB to comply with the 75 dBm

[5] Expanding Flexible Use of the 3.7 to 4.2 GHz Band, Report and Order and Notice of Proposed Rulemaking, GN Docket No. 18-122, FCC 18-91 (rel. July 13, 2018) ("*Notice*")

[6] *Notice* ¶ 164.

[7] AT&T Reply Comments, Dec. 18, 2018 at 22. CTIA Comments, Oct 29, 2019 at 23-24. T-Mobile Reply Comments Dec. 11 2018 at 39. Ericsson Reply comments Dec. 11. 2018 at 26.

limit.[8] Furthermore, considering 16 beams are generated by a M-MIMO system, the power would have to be further reduced by 12 dB.[9] Such limitations would severely reduce the coverage provided by each base station and limit the ability to provide services to rural America.[10]

Samsung supports the Commission's setting reasonable limits on out-of-band emissions which balance the need to protect adjacent channel users while recognizing the capabilities of hardware. For base station transmitters, Samsung recommends the Commission adopt conducted emissions levels of:

-13 dBm/MHz at the band edge to 20 MHz offset

-40 dBm/MHz at 20 MHz to 40 MHz offset from the band edge, and

-60 dBm/MHz at 40 MHz beyond the band edge.

[8] The total EIRP for a 50 MHz channel would be 82.2 dBm when applying the 3280 W/MHz limit, to comply with the 75 dBm limit the power spectral density would have to be 58 dBm/MHz (631 W/MHz).

[9] A 16 layer M-MIMO transmitter would be capable of 16 simultaneous beams. Since the 75 dBm is summed over all elements we believe this would result in a further reduction in the power spectral density of 12 dB, resulting in the permissible limit of 46 dBm/MHz (39.8 W/MHz).

[10] To the extent the Commission still envisions a need to limit the overall power that may enter into a receiver operating just above the mobile allocation, Samsung recommends the Commission adopt an EIRP limit of 75 dBm/20 MHz for base station transmitters operating in the highest 20 MHz allocated to mobile services. This will balance the need for higher power operations to meet rural broadband deployment while recognizing that the receive filter roll-off characteristics for services operating above the mobile service allocation will be primarily influenced by operations in the highest channel of the mobile service. This limit should be consistent with the Commission's final decision on licensed block size and Samsung recommends the Commission scale accordingly, *Notice* ¶ 135. If the Commission adopts the adjacent license band plan as proposed by AT&T making use of the guard band frequencies, the limit we proposed is for the first channel adjacent to the guard band. Operations in the guard band may need to have different levels of transmitter power as noted by AT&T; Letter from Henry Hultquist, Vice President, Federal Regulatory, AT&T Services, Inc., to Marlene Dortch, Secretary, FCC, GN Docket No. 18-122 (filed May 23, 2019) (*AT&T May 23 Ex Parte*) at 5.

For mobile user equipment, Samsung agrees with many commenters and recommends the Commission adopt emissions levels consistent with those specified by 3GPP for band class n77 of -13 dBm/MHz at the band edge.[11]

As noted by AT&T, T-Mobile and Qualcomm, the C-Band Alliance (CBA) proposed emissions mask for mobile user equipment is excessively restrictive and would seriously impair the deployment of 5G services in the US,[12] Samsung agrees. Samsung believes the 3GPP emissions levels are a good baseline in resolving interference concerns with respect to mobile devices, as the Commission's previously adopted power levels and emission levels for Citizen Band Radio Service ("CBRS") devices are consistent with our proposal. We agree with AT&T and T-Mobile that the CBRS emission levels previously adopted by the Commission provide protection of adjacent satellite operations from harmful interference due to CBRS operations below 3700 MHz.[13]

Samsung agrees with Verizon and Nokia that the use of a coordinated approach / network management techniques applied on a local basis when operating near FSS earth stations will enable the most efficient use of spectrum.[14] Such approaches will enable reasonable emissions levels and operational transmit power levels to be adopted by the FCC while providing co-

[11] Reply comments of AT&T, GN Docket 18-122 (filed Dec. 11, 2018) at 23. Comments of Verizon, GN Docket 18-122 (filed Aug 7, 2019) (*Verizon Aug 8 comments*) at 10. Comments of Qualcomm Incorporated, GN Docket 18-122 *(Qualcomm Comments*) (filed Aug 8, 2019) at 6. Reply comments of T-Mobile, GN Docket 18-122, at 40. 3GPP TS 38.101.

[12] *AT&T May 23 Ex Parte* at 16. Reply Comments of Qualcomm Incorporated, GN Docket 18-122 (filed Dec. 11, 2018) at 2. *Qualcomm Comments* at 3. Comments of T-Mobile, GN Docket 18-122 (filed Aug 7, 2019) (*T-Mobile Aug 8 comments*) at 15.

[13] *AT&T May 23 Ex Parte* at 16. *T-Mobile Aug 8 comments* at 16.

[14] *Verizon Aug 8 comments* at 11-12. Comments of Nokia, GN Docket 18-122 (filed Aug 8, 2019) at 2.

existence on a local basis with services that may operate above the frequencies licensed to terrestrial mobile services.

III. CONCLUSION

Leveraging its rich history of innovation, Samsung is helping to make 5G a reality through the development of end-to-end 5G solutions. To facilitate the ongoing investment and innovation in 5G technologies and devices using C-band spectrum, the Commission should adopt technical regulations as outlined above so the United States can best capitalize on the promise of 5G mobile services using mid-band spectrum.

Respectfully submitted,

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